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BUREAU OF ENTOMOLOGY

FOREST INSECT INVESTIGATIONS

PRELIMINARY REPORT ON THE EXPERIMENTAL FOREST INSECT CONTROL PROJECT COUER D'ALENE NATIONAL FOREST

October 6, 1924

by

James C. Evenden
Associate Entomologist
Forest Insect Field Station,
Coeur d'Alene, Idaho

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James C. Evenden
Coeur d'Alene
Idaho.

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INTRODUCTION

In the pine forests of the western United States there is a tremendous volume of merchantable timber destroyed every year by insects. The severest of these losses have been due to epidemics of barkbeetles where a large percent of the stand is destroyed in a very few years. Infestations of this character are somewhat spectacular and are generally reported by Forest Officers and timber owners, however it is not uncommon to find such outbreaks which have been in existence for a few years with no offical report having been made. Aside from these epidemic infestations there is another condition which has become known as the normal barkbeetle infestation, which has in the past received practically no consideration from foresters.

This so called normal infestation, which is that constant loss due to the attacks of barkbeetles, is present in pine forests of all species. The infestation is made up of scattered trees or small isolated groups. As the loss from an infestation of this character may vary from 1/10 of 1 percent to as much as 1 percent or more of the total

volume of the stand, the line of demarcation between this condition and the epidemic is rather hard to draw. The writer feels that this is perhaps a question of the annual increment and the value of the timber involved. In view of this it would seem that this normal condition could no longer be accepted with indifference when the annual loss equals or exceeds the increment, especially when the stumpage value reaches such a point that the expense of treating the scattered trees and small isolated groups, with the idea of still further reducing an endemic infestation, becomes justifiable.

In the past year or two it has been stated by Forest Officers in memorandums and working plans, that the destruction of white pine in the Coeur d'Alene National Forest by the mountain pine beetle during the past ten years amounted to at least 5 percent of the total white pine volume. This loss amounts to 72,800,000 B.F., or an annual loss of 7,280,000 B. F., which has for the most part been the result of normal infestations.

Due to the marked increase in the value of stumpage during the past few years, the question which arises at this time is, " Will the present value of white pine stumpage support the control of endemic, or normal infestations of the mountain pine beetle?" To answer this question it was necessary to know what the cost of such an operation would be, and to what extent could such an infestation be reduced. For this purpose an experimental forest insect control project was instituted

in May 1924, on the headwaters of the Coeur d'Alene River, Coeur d'Alene National Forest. This project was made possible by the splendid co-operation of the Cameron Lumber Company, Spokane, Washington, and the Forest Service. An allotment of $300.00 was made by the Forest Service for the purpose of conducting this experiment, to which the Cameron Lumber Company added $100.00.

DESCRIPTION AND HISTORY OF THE EXPERIMENTAL AREA.

The area selected for this experiment is the timbered portion of the Independence Creek Drainage on the headwaters of the Coeur d'Alene River, and lies for the most part in T. 53 N., R. 1 W., B.M. The total white pine acerage of this area, which includes Snow and North Creeks, is about 3500 A. Though the timbered acerage in this region is much larger than the above figure only the white pine type is considered in this report.

The forest cover is an even aged white pine stand of 200+ years of age. Of this cover there is approximately 40 percent white pine, or about 8,500,000 board feet, the remainder being Engelmann Spruce, Douglas Fir, larch and balsam. The timber on the upper slopes is of unmerchantable species or else burned by the 1910 fires. There is perhaps some 500 acres of flat creek bottom land which is of a deep black loam soil. The remainder of the area lies on slopes varying in steep-

ness from 30 to 60 degrees with a rather smooth surface free from rocks. The soil on these slopes is a firm red clay loam.

This tract is well adapted to this experiment as it is isolated from other bodies of timber by large burned over areas several miles in width. This isolation removes all possibility of the results obtained being influenced by conditions within adjacent forests. Furthermore the data obtained from previous work on the area will aid materially in determining the actual results obtained. In 1919 it was planned to use this area for an intensive study of the mountain pine beetle. Due to the pressure of other work it was found necessary to forsake this plan to a very large extent, however a check of the loss from insect attack has been made each year, the results of which are shown in the following table.

Table Showing the White Pine Killed by the Mountain Pine Beetle on the Experimental Area from 1918-1919 inclusive.

Year of Attack:	Number of Trees	Average D.B.H.	Average Volume B. F.	Total Volume B. F.	Percent of yearly increase or decrease in volume Killed	Percent of the Total Stand Killed.
1918	16	26	1364	22,828	-----	.0026
1919	75	22	747	57.806	+ 1.532	.0068
1920	100	25	1175	117,530	+ 1.033	.0138
1921	28	26	1292	34,891	- .618	.0040
1922	22	23	1050	23.110	- .337	.0027
1923	34	27	1432	48.700	+ 1.107	.0057

The trees attacked in 1923 were the ones treated in this experiment.

From this table and the chart on page it will be seen that this infestation increased from a very low point in 1918 to a high in 1920 and

and back to a point corresponding to the 1918 loss in 1922. The 1923 loss which is the volume treated, shows an increase of 110 percent, so it is very apparent that the control work was instituted at a time when the infestation was starting to increase again. Furthermore it is very apparent that from 1918 to 1922 the infestation traveled through a distinct cycle, however space will not be taken in this report for a discussion of such cycles.

To determine the annual increment of this stand 100 increment borings were taken (*). From these borings it was found that the average tree is 25.3" D.B.H., and the average number of years required to grow the last inch of wood was 27.8. This gives an annual growth percent of .0056 of the tree contents. From the table on page 4 it will be seen that the average loss to the stand, during the course of the 1918-1921 cycle, amounts to .0068, which is .0012 more than the increment.

MOUNTAIN PINE BEETLE.

The insect responsible for the damage to the white pine in this area is the mountain pine beetle (Dendroctonus monticolae.) This insect is a stout, black, cylindrical barkbeetle about 1/5 of an inch in length. The attack is made by the adult beetles boring through

(*) It is fully realized that this number of borings will not give authentic data, however it is planned to augment this data by additional borings next season.

the outer bark and constructing a long perpendicular tunnel directly between the bark and the wood. Along this tunnel, or gallery, eggs are laid which soon hatch into small grubs, or larvae. These white legless grubs excavate short mines at right angles to the egg gallery, still remaining between the bark and the wood, which terminate in a cell where the transformation from the larvae to the adult beetle takes place. The combined result of these egg galleries and larval mines is a complete girdling of the tree causing its death. When this transformation is complete the new adults bore an emergence hole through the outer bark or take advantage of cracks or other openings. The principal emergence occurs during the later part of June and July and the new attacks occur at this time. Due to the very early spring of 1924, the writer found after arriving in the area, that the development of the broods was at least ten days further advanced than expected and that it would be necessary to complete the control work soon after, if not by the 1st of June.

CONTROL OPERATIONS

The actual treating of infested trees started on the morning of May 27th and was completed on June 1st. Prior to that time Forest Ranger Mooney and the writer spent several days in the area locating and

marking infested trees for treatment. Camp was established at the Elk Horn Cabin it being possible to work the entire area from this location. The crew consisted of four laborers, a cook, Ranger Mooney, and the writer.

Method of locating infested trees.

The infested trees were located by their discolored foliage. This method is not perfect but in this type of country it is believed to be far more efficient than the attempting an actual cruise of the area. Advantage was taken of all ridges, rock outcroppings, open places, etc, in order to secure views of different portions of the region covered, and it is believed that from 85 to 95 percent of the infested trees were located and treated. Due to the limited time remaining in which to complete this project, a very thorough examinations was not made of the headwaters of Snow and North Creeks, and it is possible that there were a few infested trees in these areas which were not treated. The location of infested trees by the foliage discoloration is very confusing as all conditions can be found. It is practically necessary to examine all dead trees which have any needles remaining.

Method of treating infested trees

The method of treatment consisted in felling and peeling the bark from the infested portion of the trunk. Axes were used for peeling

and though a short handled, straight bladed spud would greatly expedite this work, it would not supplant the axes. The trees were not bucked except when necessary to roll the trunk in order to peel the underside.

As the entire development of this insect is passed directly between the bark and the wood, the removal of the bark, while the broods are in a larval or pupal stage(*) soon results in their death. Most of the trees were very heavily infested, it being not uncommon to find from 200-300 larvae per square foot of bark. These heavily infested trees, many of them being infested to a six inch top, peeled very easily it being possible to knock off great flakes of bark several square feet in area from the lower portion of the trunk. The lightly infested trees peeled very hard and it was often necessary to chop the bark from the trunk.

Summary of the cost of the Experimental control.

Wages			
Cook	@ $90.00 per month	7 days ----------	$21.00
Laborers	Effective time	170 hours @ $0.50	85.00
	Noneffective time	88 hours @ $0.50	44.00
Subsistence	147 meals @ $0.35		54.95
Packing			8.78
Travel			16.16
Overhead (**)			25.00
		Total	254.89

(*) Transitional stage of the insect development from the larvae or grub to the new adult.

(**) The overhead charge is Ranger Mooneys salary, and the writer is not sure of the accuracy of the item.

		1924	1925
Total volume of white pine treated during project	48.700 B.F.		18980
Total number of trees treated during project	34		19
Total cost per M.B.F. treated	$5.23		7.63
Total cost per tree treated	7.49		7.62
Cost per M.B.F. per effective time of crew	$4.33		6.04
Cost per tree per effective time of crew	6.20		6.05
Cost per M.B.F. without subsistence and cook	$3.03		6.36
Cost per tree without subsistence or cook.	4.37		[illegible]
Cost per M.B.F. per effective time of crew without subsistence and cook	$2.76		4.78
Cost per tree per effective time of crew without subsistence and cook	3.96		4.77
Number of man hours per M.B.F. Effective time only	3.4		6.6
Number of man hours per tree. Effective time only	5.0		6.6
Cost per acre	$0.07		0.041

Due to the time spent on travel the noneffective time of such small projects always seems in excess of the effective. Though at the time it was not believed feasible it is now seen that the noneffective time of the project could have been reduced by 40 hours. This reduction would have lowered the total cost per M.B.F. to $4.61, and the cost per tree to $6.61. Though the writer was present throughout the operation it is felt that his salary would not be a just charge against the cost of the project, as one officer on such a small undertaking is sufficient.

SUMMARY OF THE PROJECT.

The results of this experiment will not be available until an examination of the area is made during the summer of 1925. An examination would not have been possible this fall due to the difficulty of locating the infested trees. There is such a slight fading of the trees the fall following the attach, that any data secured could not have been regarded as final.

That the infestation was increasing makes the thoughts of control more difficult, as the broods of insects were so heavy that the potential increase from one tree which was missed in the control work would be very large. It is regretted that more time was not available so that a more thorough cleanup of the area could have been made. Though all infested trees which were located were treated, it became necessary for Ranger Mooney and the writer to stop cruising for additional trees and assist in treating the ones already marked. However it is believed that the work as done would be a very fair example of maintenance control over a large area.

Subsequent reports will be prepared on the project as additional data is secured.

Respectfully submitted,

James C. Evenden,
Associate Entomologist.

Form 250

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

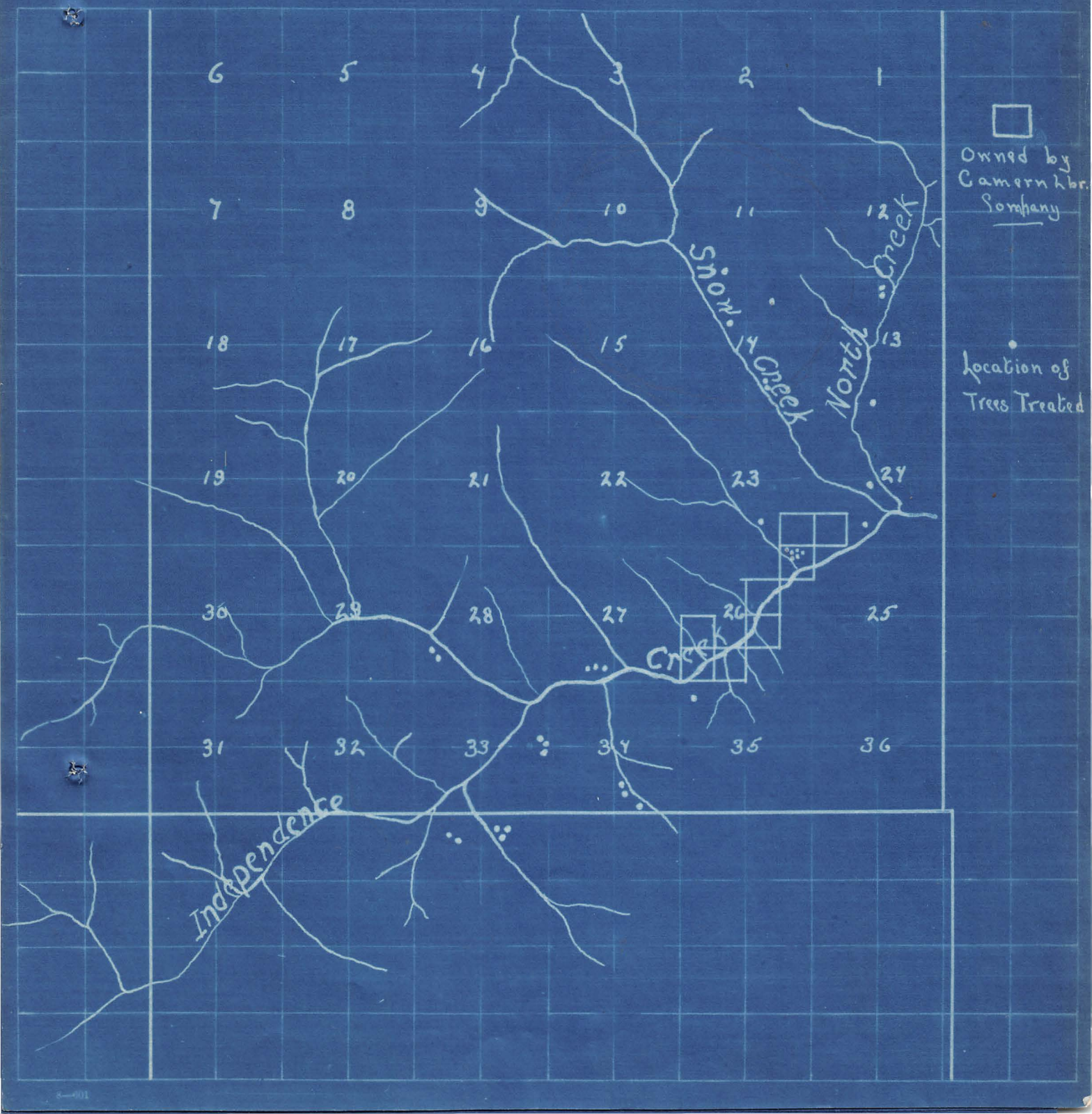
MAP SHEET

No. _____ Coeur d'Alene National Forest.

Division _____ District _____ Ranger _____

T. 53 N., R. 1 E., B M., Section _____, Quarter _____

Mapped by J. S. Evenden Scale: 1 inches = 1 mile.


6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36
Snow Creek
North Creek
Creek
Independence
Owned by Camern Lbr. Company
Location of Trees Treated

8—601

Form 250

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

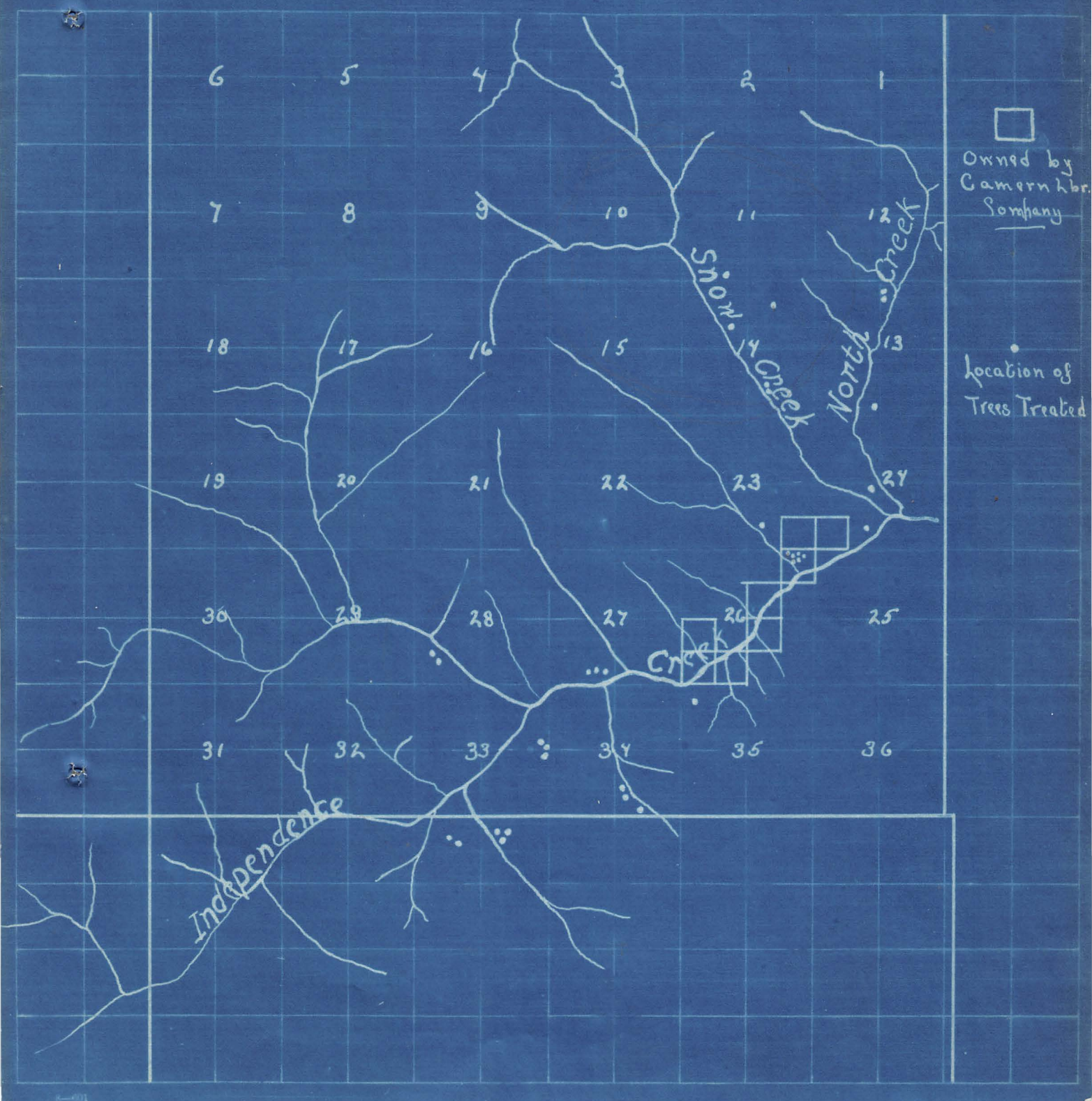
MAP SHEET

No. _____ Coeur d'Alene National Forest.

Division _____ District _____, Block _____

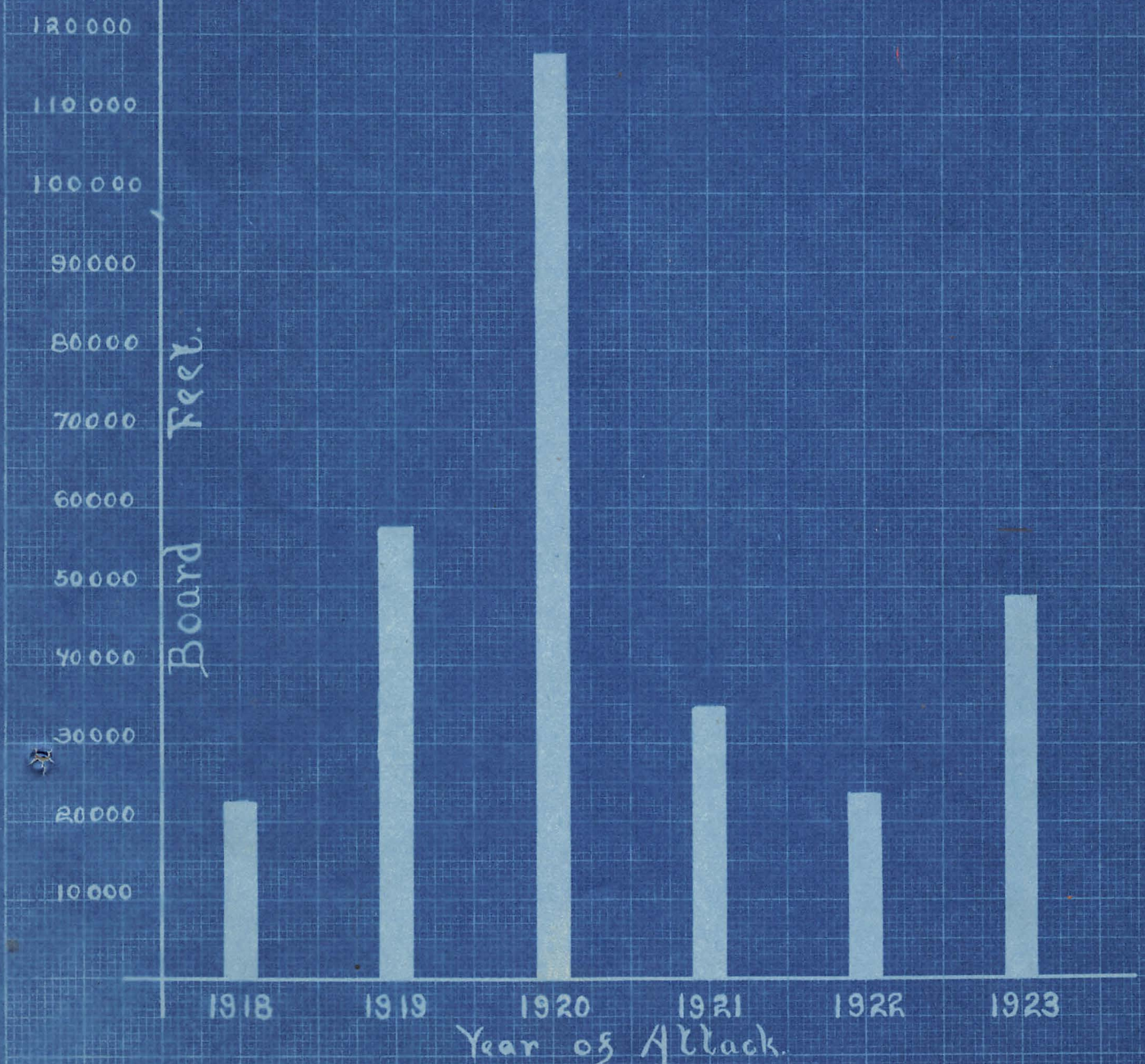
T. 53 N, R. 1 E, B M., Section _____, Quarter _____

Mapped by J. S. Evenden Scale: 1 Inches = 1 mile.

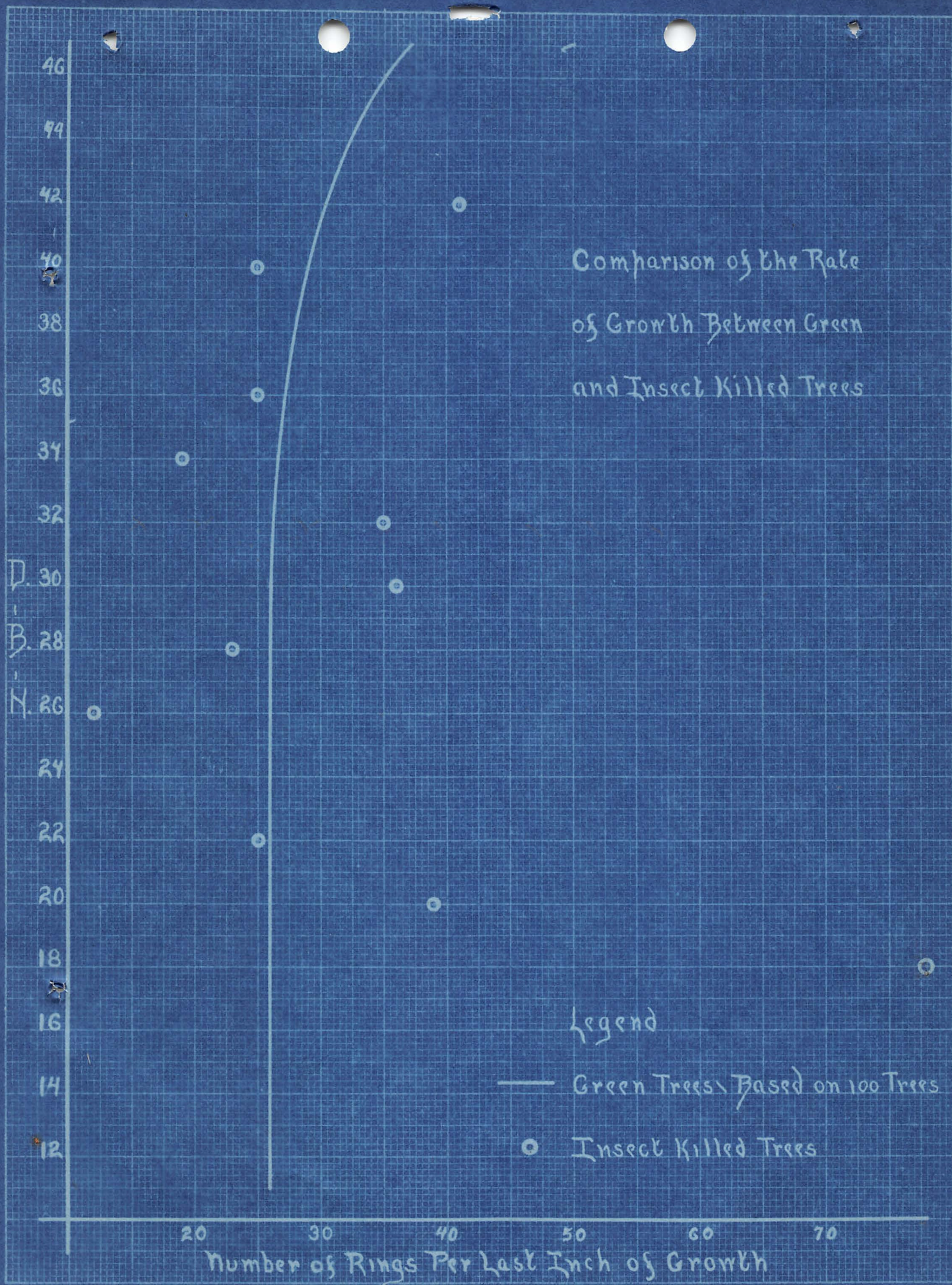


Independence Creek Experimental Area

Yearly Volume of White Pine Killed by the Mountain Pine Beetle



J.S. Evenden


Comparison of the Rate of Growth Between Green and Insect Killed Trees
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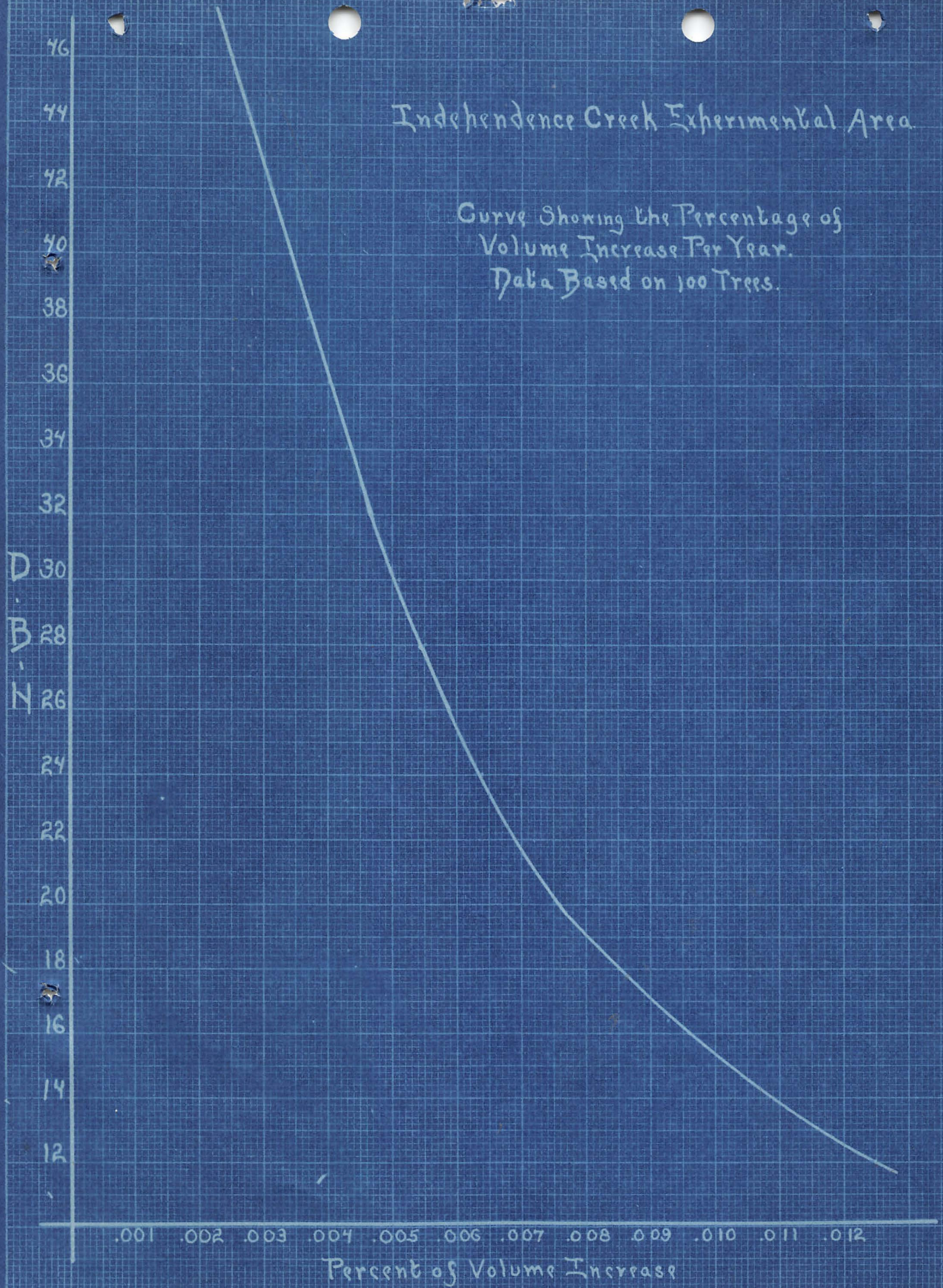
Number of Rings Per Last Inch of Growth
Legend
Green Trees Based on 100 Trees
Insect Killed Trees


Independence Creek Experimental Area.
Curve Showing the Percentage of Volume Increase Per Year.
Data Based on 100 Trees.
D.B.H.
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Percent of Volume Increase